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ABSTRACT

This article describes phonological and semantic characteristics associated with the surface structure of some Japanese sentence intonations. The aim of the long-term study is to show the place of intonation in the total system of Japanese grammar. This particular part of the study is limited to the group of intonations which are characterized by the "the terminal pitch rising." The prosodic features which are possible correlates of certain grammatical functions were isolated and quantified, using a spectrograph. The samples were provided by four speakers of standard Japanese, with every informant making five recordings of each sample item. A total of eight different intonations were identified in the terminal rising group. Direct questions in Japanese, of which there are two types, both terminating with a rising intonation, were used to demonstrate the role of this stype of intonation. The conclusion is that the question in Japanese is a response-eliciting function, specified by a terminal rising intonation. The unique logical order between question and answer is attributed to the basic function of intonation. Intonation is primarily tied in with the concurrent statement, and the response which is signaled by the rising intonation refers strictly to the affirmation or negation of that statement. (Author/TL)

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TERMINAL RISING INTONATIONS AND QUESTIONS IN JAPANESE
An Inquiry Based on Acoustic Phonetic Data

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I. INTRODUCTION

In a natural discourse no utterance is complete without prosody. Its presence constitutes an integral part of an utterance's physical as well as grammatical reality. For instance, a speaker asks, "Taberu? "("Are you going to eat?"), and a listener responds, "Taberu," ("Yes, I will"). The speaker first exploits utterance prosody to convey the grammatical notation of question. The listener in return decodes this prosodic cue before he states his response, which is replete with its own prosody of statement. Finally, this response is interpreted accordingly by the original speaker. This verbal interaction is hardly possible without prosody.

The utterance prosody, which I call sentence intonation here, has escaped serious analysis in the past, not necessarily because of its marginal position in the linguistic system as suggested by the intonation-free conventional orthography, but mainly because of its inherent complex nature, phonologically as well as semantically. True that one needs not, as the above example might suggest, be an expert to list a few intonation-related grammatical functions such as question and statement. Neither is it necessary for one to be trained in phonetics to note some of the most obvious prosodic characteristics such as the movement of pitch and the placement of stress. However, linguists who are interested in more objective statement have

not been in a better position. Their main reason is the lack of a viable method of studying intonations.

Linguists have been asking such questions as what is sentence intonation and where does it stand in the total system of Japanese grammar. These are the ultimate goals of an intonation study. The fact is that before a linguist can answer those questions he needs to know the surface manifestation of sentence intonations.

The primary goal adopted for this study is just that: a description of the phonological and semantic characteristics associated with the surface structure of Japanese sentence intonations.

Sentence intonations are studied here through a systematic analysis of phonetic data. The assumption underlying this strategy is that each grammatically significant intonation possesses a distinct phonetic correlate, and a careful study of such a phonetic property leads to a better understanding of the phonological and semantic characteristics of intonation, individually as well as collectively.

Information concerning phonetic correlates is provided by acoustic analyses of intonation prosody. A detailed account of pitch, length, and loudness factors in an intonation is obtained through the use of an instrument called a spectrograph. This instrument converts vocalized utterance prosody into a visual spectrum called a spectrogram. In a spectrogram prosodic features, which are possible correlates of certain grammatical functions, are isolated and quantified. The fundamental frequency

and duration features are measured for comparison while the intensity is studied on the basis of overall configuration. As for the statistical accuracy of the measured data, the spectrographic samples are provided by four speakers of standard Japanese, with every informant making five recordings of each sample item.

This type of data-based phonological study requires a word of caution. Approached with an awareness of its characteristics and limitations, it offers, especially in a study of such complex matter as sentence intonation, information no other type of investigation can provide. It is important to remember, however, that the analysis of surface structure does not constitute an automatic discovery procedure of any hidden grammatical system; e.g., that of sentence intonation. It is quite likely that there is no such entity as a sentence intonation in the deep structure. At best, it is safe to assume that the manifestation modes in terms of sentence intonation and underlying grammatical categories are related to each other in a complex way. The data study per se is not intended to explain such a relationship, but it does provide crucial information, without which one cannot even begin to understand the status of sentence intonation in the total system of Japanese grammar.

Only a portion of the result of my study is reported here. It is limited to the group of intonations which are characterized by the terminal pitch rising. Other types of intonations such as terminal non-rising and non-terminal intonation groups are covered in Hojo (1973). Now we deal with what sort of semantic information the terminal rising intonations convey and exactly how this information is prosodically encoded.

The underlying assumptions and the analytical procedures which I have employed for this study, are followed by the description of the findings; i.e., the phonological and semantic characteristics of the individual intonations. Lastly, I will discuss a few items of grammatical interest, particularly in relation to question in Japanese grammar.

II ASSUMPTIONS AND ANALYTICAL PROCEDURE

In order to give a methodological consistency to the study, the multitude of intonations are divided into two types: the basic and the derived. The basic type intonation refers to the prosody of an utterance in citation form. The citation form utterance is equipped with its lexical and syntactic meanings, but it is free of any intonation-related semantic coloring. In other words, the absence of any such coloring is the main function of the basic type intonation. Phonetically speaking the basic type intonation faithfully reflects the inherent (or adjusted, if the utterance is multi-worded) accent pattern of the constituent word(s) of the utterance. The second type of intonation, that of a non-citation form utterance, is considered as derived from the basic type. They are construed as derived because their grammatical functions are manifested by the modification of prosodic features in the basic type intonation. The intonation-related grammatical function of a non-citation form utterance is viewed as responsible for the phonetic difference between the basic and the derived intonations.

Given a word, "kaeru" ("to go home"), a citation form utterance "Kaeru," ("You are going home,"), and a question utterance "Kaeru?" ("Are you going home?"), the accent of the word "kaeru" constitutes the basic intonation in the citation form utterance "Kaeru." Its intonation being of the basic type, besides its lexical and syntactic meanings, it is devoid of any intonation-related coloring. On the other hand, the utterance "Kaeru?" is a question, and this question function is attributed to its derived intonation. This grammatical difference between the two utterances is reflected by the prosodic difference between them.

In a natural discourse, more often than not a typical utterance consists of more than one word. However, the same difference between the basic and the derived intonations applies regardless of the number of words in an utterance.

Intonation samples in this study are all taken from one-word utterances of the same segmental construction. This arrangement is adopted to keep the analysis within manageable range. One of the advantages is to minimize the interference of non-intonation elements while maximizing the usefulness of gathered data.

The basic intonation, despite the singularity of its grammatical meaning, possesses clearly different physical manifestations depending upon the accent pattern of the underlying word. This necessitates a need for an understanding of the Japanese word accent system so that accent prosody will not interfere with the study of intonation prosody. A preliminary study showed that the terminal accent level affected intonation prosody differently. Therefore, all Japanese word accents are classified into two types: the

terminally high-pitched type (consequently, the terminally high-pitched basic intonation), and terminally low-pitched type (the terminally low-pitched basic intonation likewise). An utterance "Yonsen-en," ("It's 4,000 yen,") represents the first type and an utterance "Nijuu-doru," ("It's twenty dollars,") represents the second type in this study. These two utterances served as the input since not all the prosodic differences are intonationally motivated.

III FINDINGS

Basic Type Intonation. The basic type intonation registered the following phonetic characteristics. The pitch level peaked at the second syllable (n of yonsen-en, and ju of nijuu-doru) and the terminal pitch level was either high or low depending on the pitch pattern of the underlying word (high for yonsen-en, and low for nijuu-doru). (Fig. 1) The length and loudness of individual syllables were maintained approximately even throughout the utterances, regardless of the fluctuation in pitch. (Fig. 1 and Table 1). As explained earlier in the assumption, these prosodic features of the basic intonation are to be modified in order to produce various derived intonations.

Derived Type Intonations. The examination of various derived intonations first revealed that the basic intonation was modified in two portions; non-terminally from the onset to the penultimate syllable (the underlined portions of yonsen-en and nijuu-doru,) and terminally in the last syllable. In other words, the sentence intonation of an utterance consists of two functionally independent non-terminal and terminal intonations.

The rising intonations, which I am concerned about in this report, belong to the terminal intonation group. They are realized as variations of the terminal syllable prosody. Various types of analyses were attempted in order to identify any systematic pattern of modification and possible phonetic correlates. The study of their fundamental frequency values failed to turn up any systematic pattern. Next, the fundamental frequency values were transferred to the relative pitch scale. The fundamental frequency of each terminal intonation was first measured at every two centi-second interval and the readings were charted on a semi-logarythmic graph paper (the horizontal regular scale is for time and the vertical logarythmic scale is for pitch), in order to examine the change of relative pitch in time. The change was quantified in semitome. (Fig. 2). It turned out that each speaker demonstrated four distinct types of terminal pitch rise, which are referred to here as the sharpest, the sharp, the mild, and the mildest rise. The exact degree of rise (the correlated measurement of pitch change in semitone per centi-second) differed considerably from one informant to another, and even the same informant used different degrees of rise for the same function depending on the terminal pitch level of the underlying word. The exact reason for these fluctuations was not found in the available data nor analyses thereof. Nevertheless, they consistently maintained the four-way contrast in terms of the degree of pitch rise. (Table 2).

Following the examination of the fundamental frequency feature the duration was analyzed. A two-way contrast of short and long emerged. A further study revealed that this contrast was due to the timing of the terminal pitch rise. Sometimes, the rise started immediately after the last syllable began, and at other times there was a definite delay in rise as long as the length of the last syllable of the basic intonation. (Fig. 3 and Table 3). This timing feature was observed with each one of the four types of pitch rise.

The intensity feature participated consistently in the manifestation of the terminal intonations. However, it did not involve any contrastive pattern.

The recurring phonetic patterns were potentially correlates of some sort of grammatical function. The four types of pitch rise were associated with their distinct grammatical meanings. The sharpest pitch rise was correlated with double checking. It was used when the speaker already had the information but wanted a confirmation of its accuracy from the listener; in other words, it was used for the purpose of double checking. This was called here a confirmatory question. The sharp rise was used when the speaker had no idea what the answer would be; he did not have the definite information and sought it from the listener in terms of hai (affirmative) or iie (negative). This sharp rise was given the name of information-seeking question. The speaker used the mild pitch rise, not to obtain a confirmation or to seek a hai-iie response but to influence the listener to respond further, concerning the information in the question utterance.

The speaker possessed the information, as imparted earlier by the listener, but found it difficult to accept. Therefore, he repeated the information with this mild rising pitch, expecting the listener to perceive his reluctance. So, it was called a doubting question. The mildest pitch rise was used when the speaker was soliloquizing, while conscious of the presence of a listener. Strictly speaking, it is not a question because it does not expect a verbal response from the listener. The name musing question was given to it.

While all these four types of pitch rises elicited responses from a listener about the information contained in the question, it was noted that the timing of the rise, normal or delayed, directed the attention of the speaker and the listener to the different aspects of the information. The quick rise's focus was the content of the information, something like "Did you mean 4,000 yen?" against the delayed rise's focus which was on the information in the way it was stated, by creating the effect like "Did you say 4,000 yen?" The quick rise was referred to as content-oriented and the delayed rise was called a statement-oriented question.

IV DISCUSSION AND CONCLUSION

In the terminal rising group a total of eight different intonations were identified. All of them shared such phonological features as the terminal location of occurrence, the phonetic feature of pitch rising, and the uniform adherance to the normal and delayed rise. Semantically speaking, their terminal location suggested listener-orientation, the rising pitch contour meant that a response was sought from the listener, and the uniformly

observed normal and delayed rise indicated that they all belong to the same functional group. Differences among the eight variations are more in degree than in kind. Further discussion concerning the general characteristics and domain of intonation needs to incorporate information about non-rising terminal and non-terminal intonations, which are not included in this report. Subsequent discussions, therefore, are limited to the terminal rising intonations and the grammatical category of question.

There are two major types of direct questions in Japanese. One is hai-iie type (including either-or type), and another is an interrogative type (WH type in short) question. However, the exact grammatical nature of Japanese question needs further scrutiny.

A cursory check of question utterances indicates that, whether it is a hai-iie type or a WH type, it must be terminated with a rising intonation. Contrary to the tacit understanding shared by linguists such as Jorden (1962, pp. 9-10) and Alfonzo (1966, p. 13) that a sentence particle ka can change a statement to a question, ka is neither obligatory for a question utterance, nor does it always imply a question. Ka, when it is not accompanied by a rising pitch, adds meaning something like "I see" to the statement. This inherent property of ka and its superimposed intonation are two distinct matters. The minimum requirement for a question utterance is a rising intonation in the terminal syllable and that alone signals a response-elicitation in Japanese.

A WH question is no different. It does not occur without a terminal rising intonation. (Utterances such as "Dooshite?" ("Why?)

and "Doko?" ("Where?") occur sometime without a terminal rising intonation. They are semantically, and therefore derivationally, different from the ones with a terminal pitch rise. They may be treated syntactically as variations of embedded question and intonation-wise as variations of terminal non-rising intonations). As in the case of hai-iie question utterances, the terminal pitch rise of a WH question signals a response elicitation. The presence of an interrogative word simply specifies the type of response expected.

All this supports the idea that a direct question in Japanese is phonetically manifested as a terminal rising intonation, and semantically it is a function of response-elicitation. Whether the elicited response is a hai-iie type or a WH type depends upon the presence of an interrogative word in the question.

Another linguistically interesting phenomenon about Japanese question is the logic which relates a question with an answer. Response such as "Hai (affirmative), ikimasu ("I am going")," and "Iie (negative), ikimasen ("I am not going")," presents no problem. However, ones like "Hai (affirmative), ikimasen ("I am not going")," and "Iie (negative), ikimasu ("I am going") are not at all unusual in Japanese. Jorden (1962, p. 10) and Alfonzo (1966, p. 47) say that this phenomenon is limited to the negative question, while Kuno (1973, pp. 274-275) argues that without considering the presupposition of the speaker it is not predictable. In any case when it happens, it is generally agreed that hai (affirmative) is equated with English no, and iie

(negative) with yes (Jorden, 1962, p. 10, Martin, 1962, pp. 364-365 Kuno, 1973, p. 273), or with that is right and that is wrong respectively (Alfonzo, 1966, p. 47). The point is simply that "*Yes, I am not going," and "*No, I am going," are not acceptable in English. Then why does this irregular logic operate in Japanese? Is it truly limited to the negative questions alone?

The terminal rise signals a response elicitation (a question). Not only that, it sets up the information about which the response is sought. A study of response indicates what this information is all about. It is the specific statement presented in the question utterance. If it is correct, whether it is affirmatively stated or negatively worded, the response is hai (affirmative) and if incorrect, iie (negative), followed by the logically correct statement which can be either affirmative or negative.

A totally different type of logic operates in English. In English, whether the linguistic reality of the question statement is affirmative or negative, the response states only the logical reality of the situation. The English model may be termed as a logical question because the logical reality supercedes linguistic reality, while the Japanese counterpart can be called a grammatical question because the response recognizes the linguistic reality of the question statement as well as the logical reality of the situation involved.

The Japanese logic of question and answer is just as systematic as that of English. It operates on a different principle. The study so far suggests that this principle of Japanese logic is

provided by the rising intonation. It elicits a response concerning the statement in question, as if to say "You are going (a statement), right or wrong (response elicitation)?" or "You are not going (a statement), right or wrong (response elicitation)?" This intonation-based logic is operative all the time, as the rising intonation is, whether the question is negative or not. In fact, so far as Japanese question (response-elicitation) is concerned, whether the question statement is in the affirmative or negative mode is an irrelevant matter.

To recapitulate, Japanese question is a response elicitating function, specified by a terminal rising intonation. The unique logical order between question and answer is attribted to the basic function of intonation. Intonation is primarily tied in with the concurrent statement and the response which is signaled by the rising intonation refers strictly to the hai (affirmation) or iie (negation) of that statement.

Terminally-High Pitched Basic Intonation

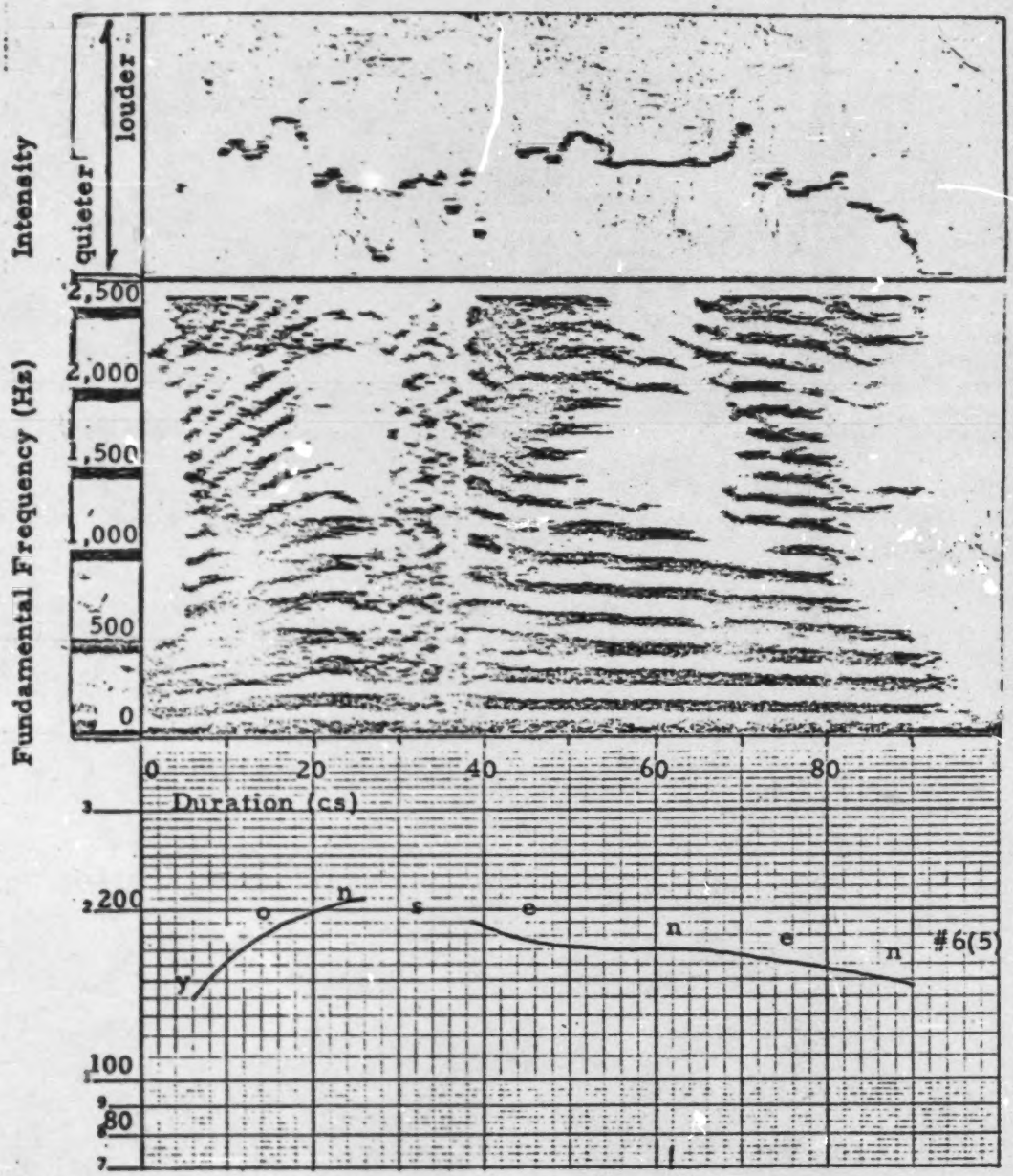


Fig. 1.--SAMPLE SPECTROGRAMS OF BASIC INTONATION, AS SPOKEN BY INFORMANT THREE

Terminally-Low Pitched Basic Intonation

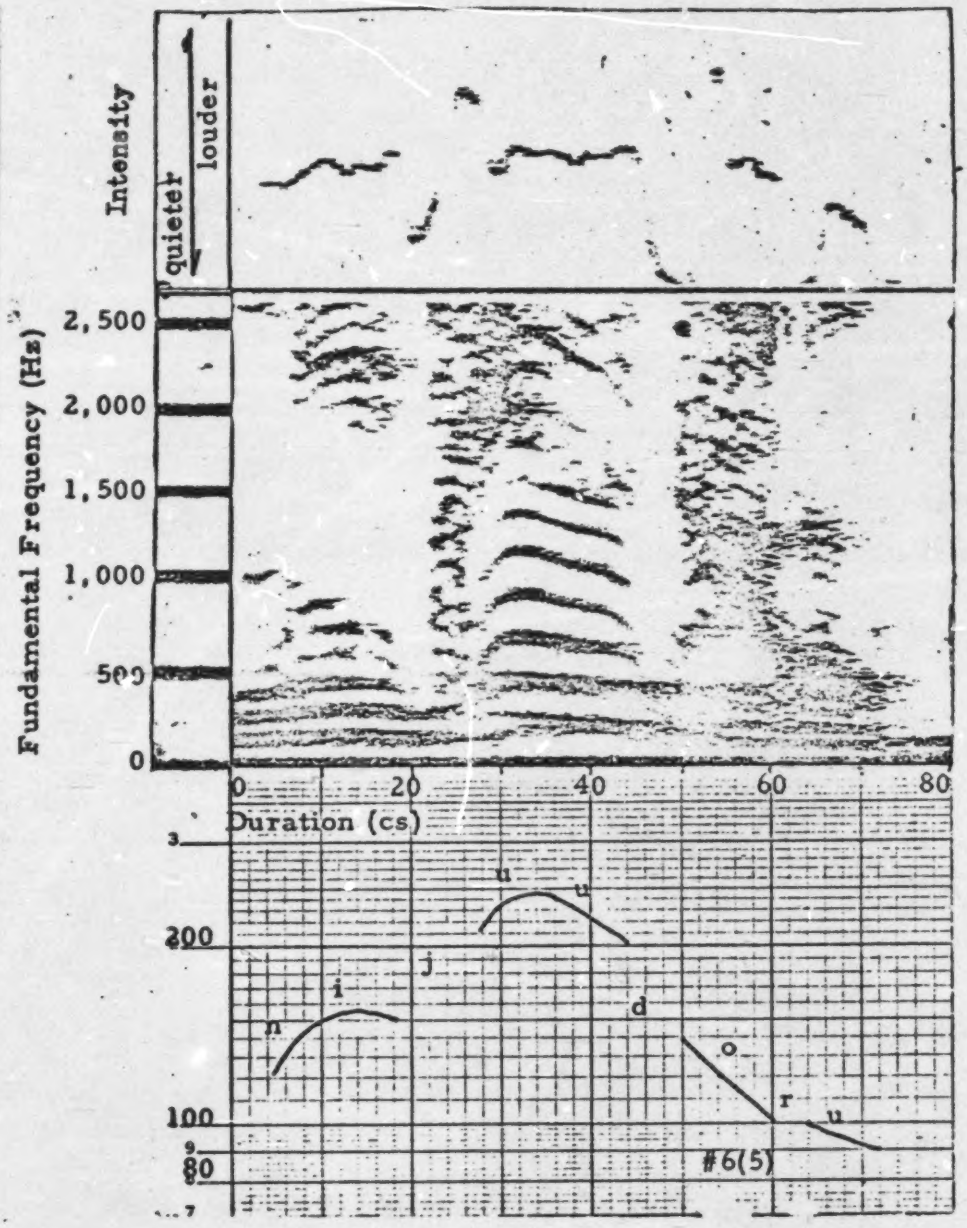


Fig. 1.—Continued

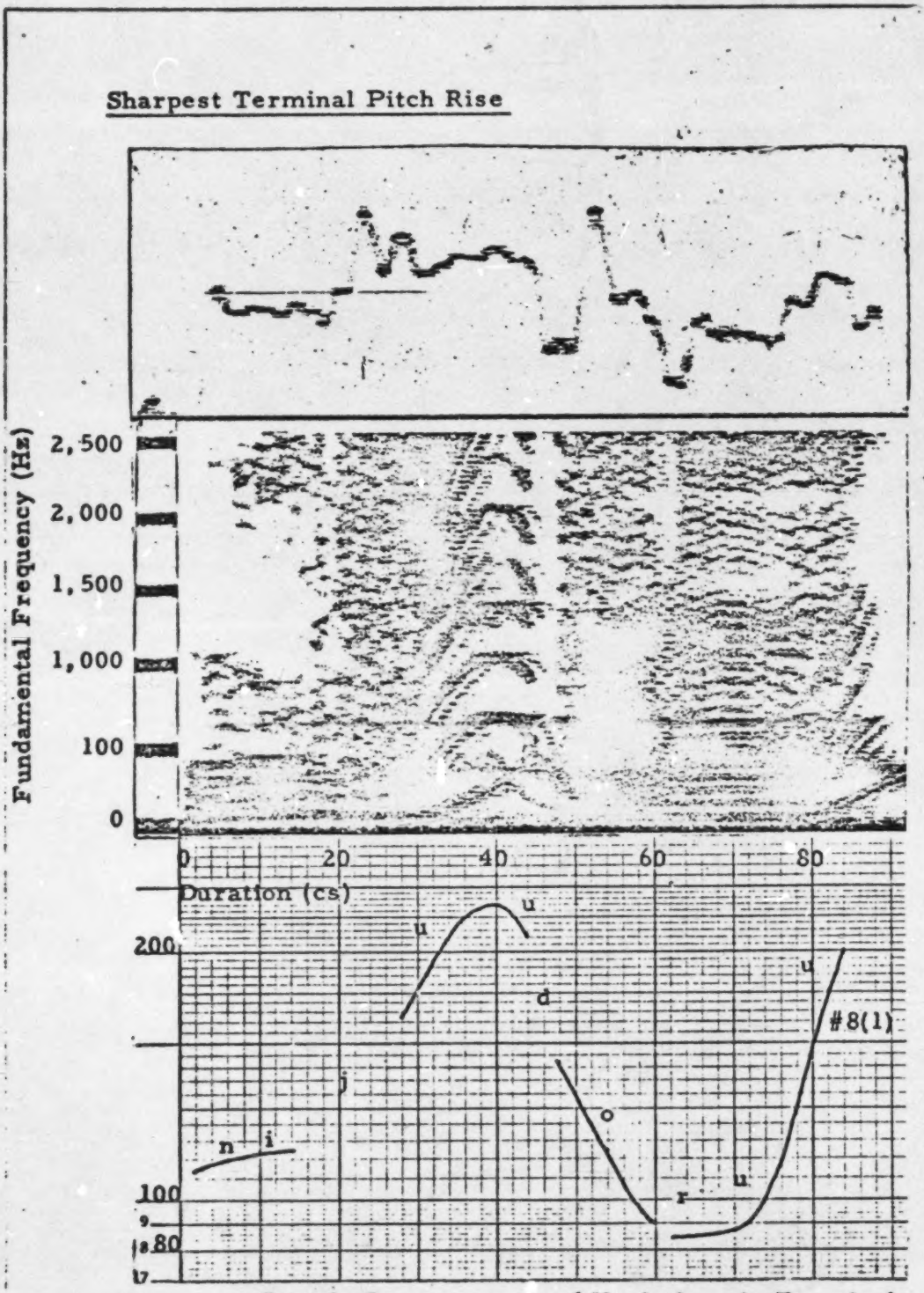


Fig. 2. --Sample Spectrograms of Variations in Terminal Pitch Rise, as Spoken by Informant Three

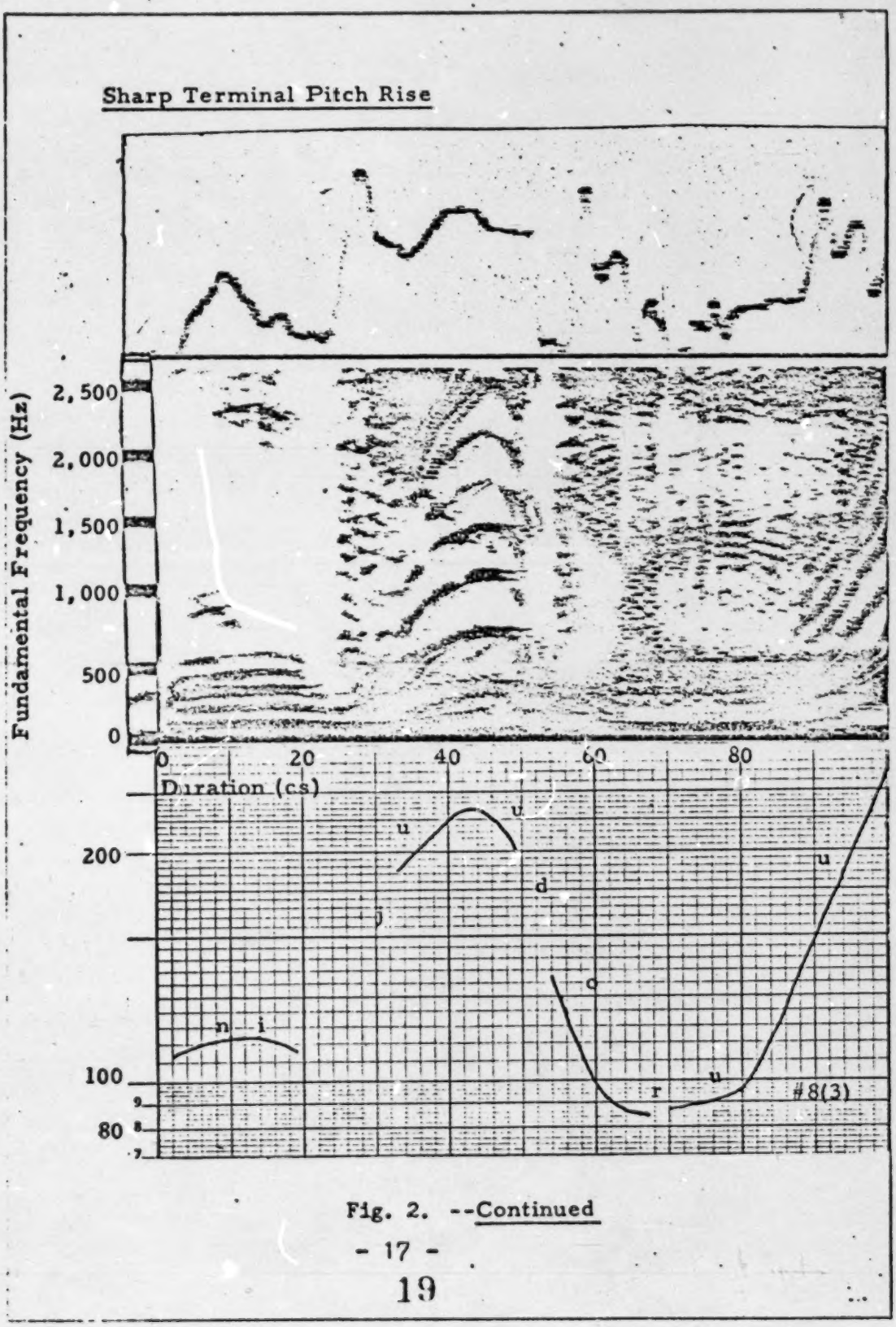


Fig. 2. --Continued

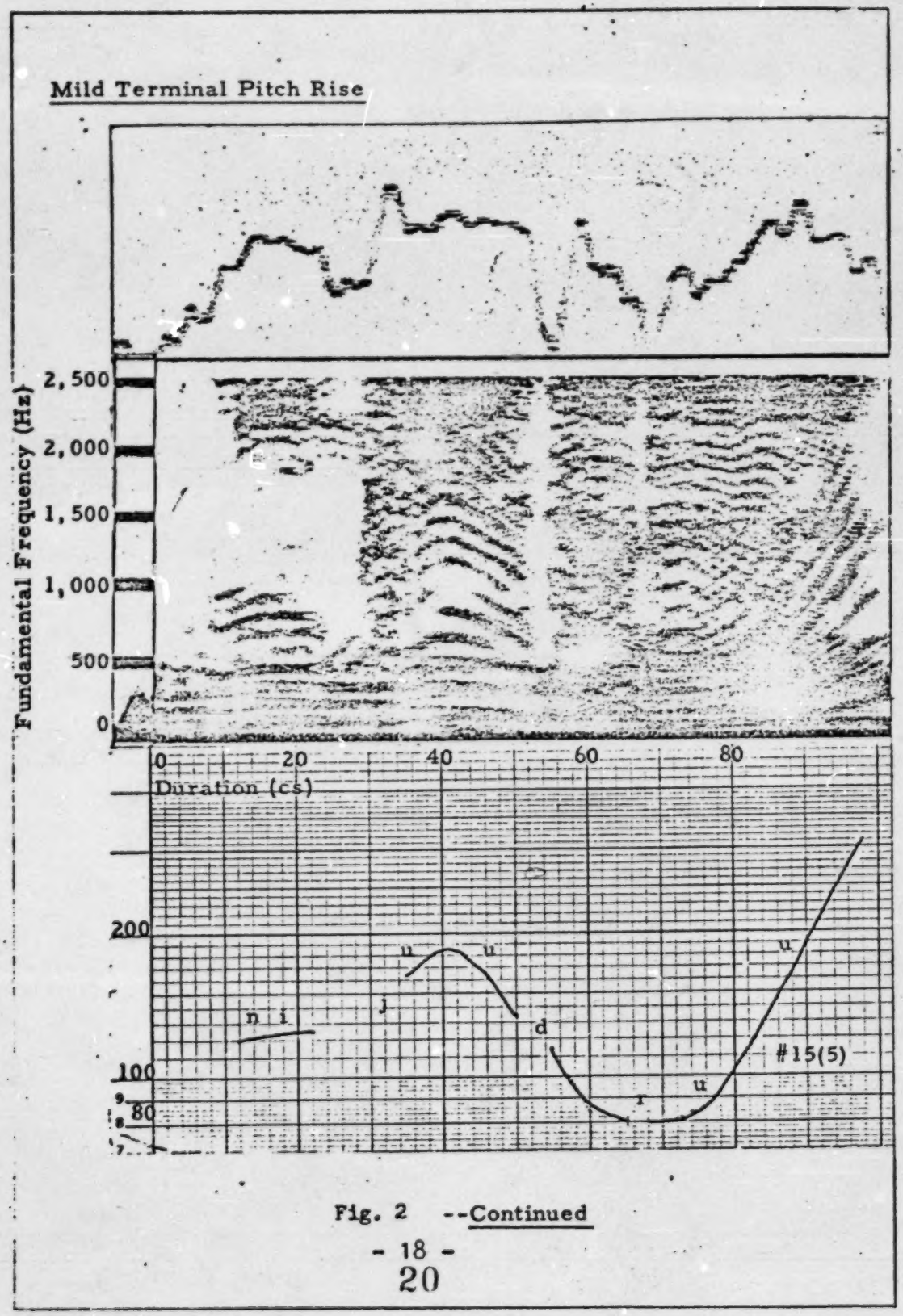


Fig. 2 --Continued

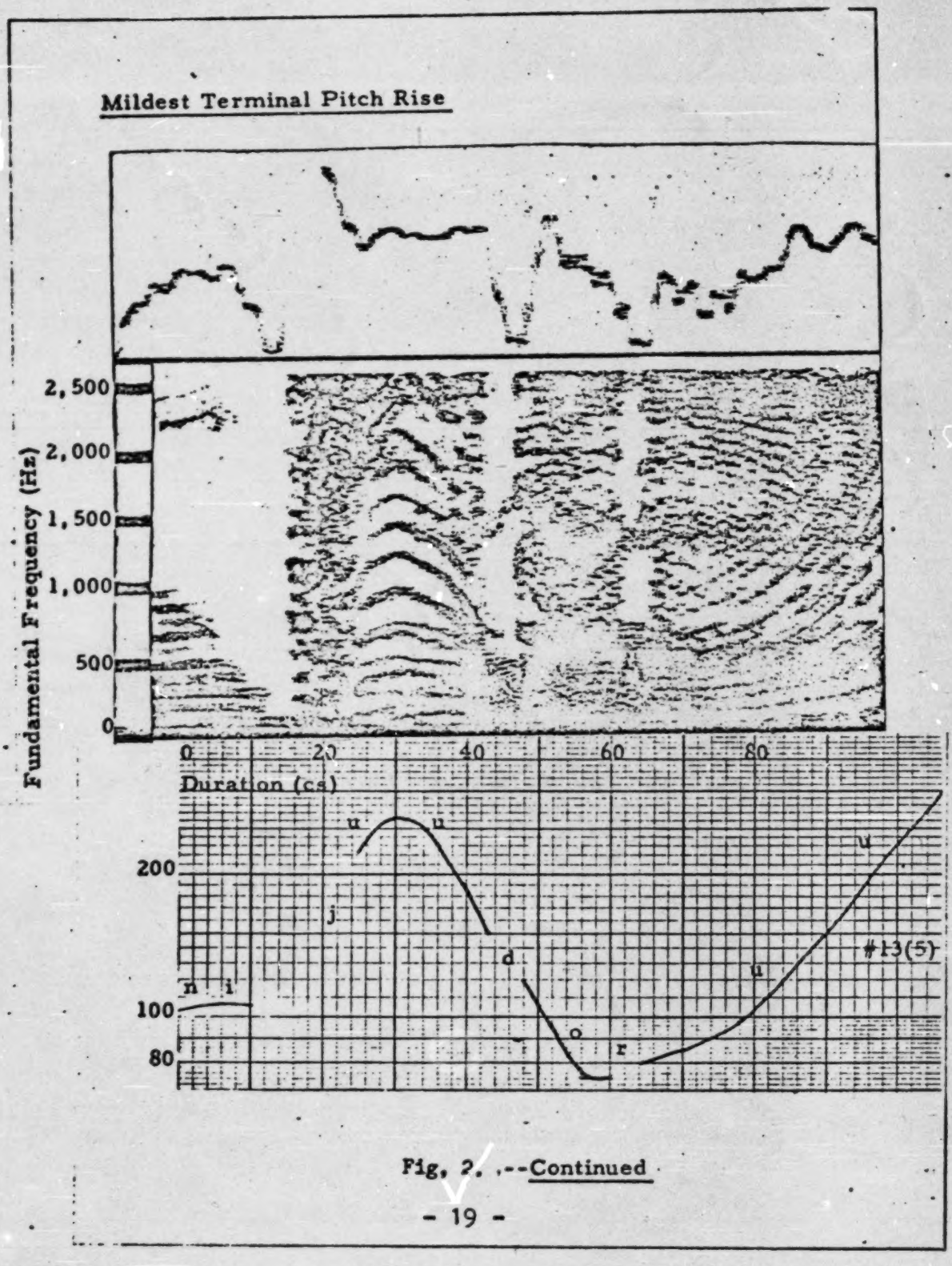


Fig. 2. --Continued

Quick Terminal Pitch Rise

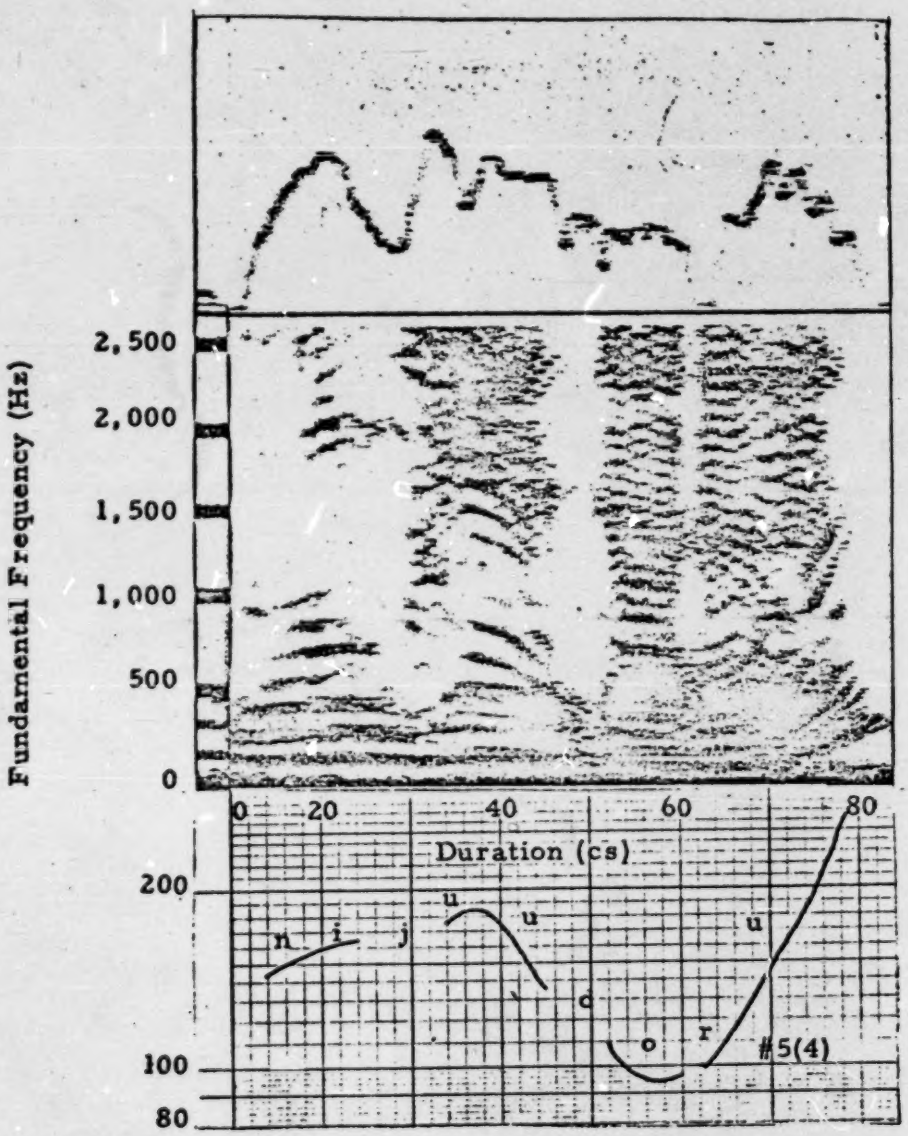


Fig. 3 .--Sample Spectrograms of Quick and Delayed Terminal Pitch Rise, as Spoken by Informant Three

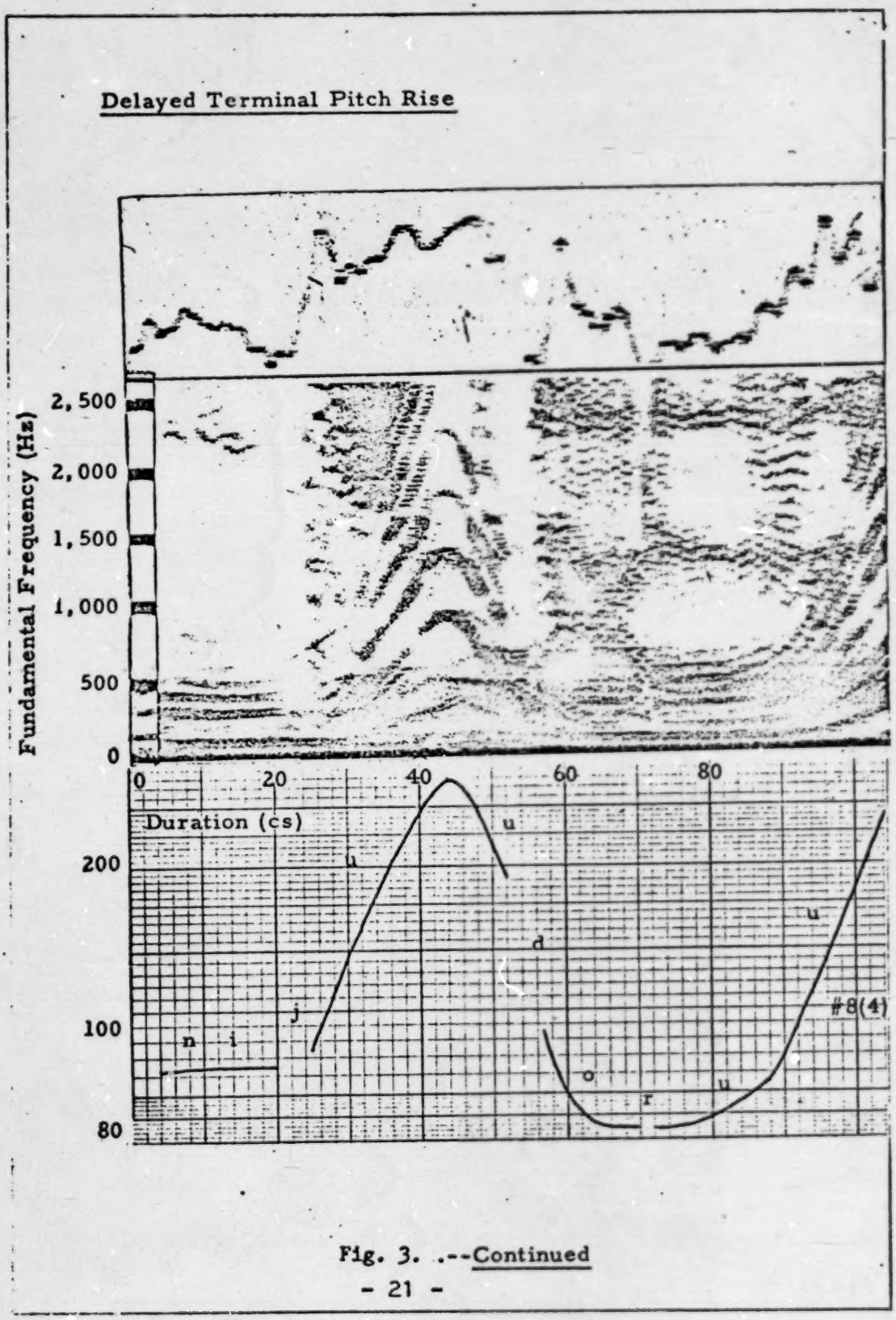


Fig. 3. .--Continued

- 21 -

TABLE 1

AVERAGE SYLLABLE DURATION DATA (in cs)
FOR BASIC INTONATION FOR FOUR INFORMANTS

Test Utterances	Average Syllable Duration		
	Pre-Peak	Pre-Terminal	Terminal
"Yonsen-en."	12	14	12
"Nijuu-doru."	15	14	11

TABLE 2

DEGREE OF TERMINAL PITCH RISE
(in semitones per centisecond)
EACH INFORMANT USED
FOR YONSEN-EN AND NIJUU-DORU

Pitch Rise Type	Pitch Rise in Semitones per Centisecond									
	"Yonsen-en."					"Nijuu-doru."				
	Inf.1	Inf.2	Inf.3	Inf.4	Ave.	Inf.1	Inf.2	Inf.3	Inf.4	Ave.
Sharpest	3.0	1.7	3.5	—[a]	2.4[b]	5.1	2.6	3.7	4.0	3.9
Sharp	2.4	1.2	2.0	0.9	1.9	3.2	2.1	2.6	2.6	2.6
Mild	1.6	0.8	1.6	0.7	1.2	2.7	1.3	2.0	1.7	1.7
Mildest	0.8	o.4	1.1	0.3	0.7	1.5	1.0	1.6	1.3	1.4

[a] Data not available.

[b] The value 2.4 was simulated. Informant Four lacked samples of the sharpest rise, which made the straight computation of the average impossible. However, it was consistently noted that the ratio among the four types of rise was either 1:2:3:4 or 1:1.5:2:3, and that the terminal rise for Informant Four's "Yonsen-en" followed the first type. Consequently, the value 1.2 was obtained for his sharpest rise which was in turn added together with the figueres for other informants in order to obtain the average value 2.4 for the group.

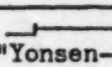
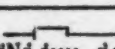
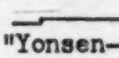
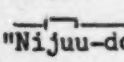
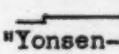
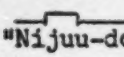
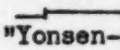
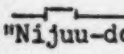
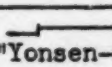
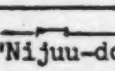
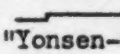
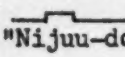
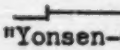
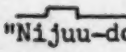
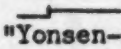
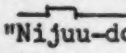
TABLE 3

AVERAGE DURATION OF THE PRE-RISE DELAY
(in cs) FOR THE FOUR INFORMANTS

Timing of Pitch Rise	Average Duration of Pre-Rise Delay	
	"Yonsen-en."	"Nijuu-doru."
Normal Rise	0	0
Delayed Rise	10	12

TABLE 4

RISING INTONATIONS AND THEIR SYMBOLIZATION

Type of Question		Symbolization	
		"Yonsen-en."	"Nijuu-doru."
Content-oriented	Confirmatory	 "Yonsen-en."	 "Nijuu-doru."
	Information-seeking	 "Yonsen-en."	 "Nijuu-doru."
	Doubting	 "Yonsen-en."	 "Nijuu-doru."
	Musing	 "Yonsen-en."	 "Nijuu-doru."
Statement-oriented	Confirmatory	 "Yonsen-enn."	 "Nijuu-doruu."
	Information-seeking	 "Yonsen-enn."	 "Nijuu-doruu."
	Doubting	 "Yonsen-enn."	 "Nijuu-doruu."
	Musing	 "Yonsen-enn."	 "Nijuu-doruu."

Keys to notations:
↓ .....confirmatory
↗ .....information-seeking
/ .....doubting
// .....musing
normal terminal syllable....content-oriented
doubled terminal syllable...statement-oriented

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